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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/584,413	04/25/2007	Yuichiro Itai	1982-0288PUS1	9416

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EXAMINER	
CLARK, GREGORY D	

ART UNIT	PAPER NUMBER
1794	

NOTIFICATION DATE	DELIVERY MODE
11/27/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary	Application No.	Applicant(s)	
	10/584,413	ITAI ET AL.	
	Examiner	Art Unit	
	GREGORY CLARK	1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *11-20* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *06/26/2006, 10/04/2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Restriction is required under 35 U.S.C. 121 and 372.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In accordance with 37 CFR 1.499, applicant is required, in reply to this action, to elect a single invention to which the claims must be restricted.

Group I, claim(s) 1-10, drawn to device.

Group II, claim(s) 11, 18-20, drawn to apparatus.

Group III, claim(s) 12-17, drawn to method.

The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: The special technical feature does not provide a contribution over the prior art because the special technical feature is disclosed by Zhou (Advanced Functional Materials 2001, No. 4, P. 310-314) which teaches triphenylamine derivatives and , 2,3,5,6-tetrafluoro-7,7,8,8 tetracyanoquinodimethane (F4-TCNQ) are prepared by coevaporation which can be controlled independently measuring them with separately quartz thickness monitors allowing the ratio to be controlled (gradient thickness) (page 311). Zhou mentions that

the conductivity of the film (HIL) increases with dopant (F4-TCNQ) concentration (thickness).

During a telephone conversation with Eugene Perez on 10/22/2009 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-10. Affirmation of this election must be made by applicant in replying to this Office action. Claims 11-20 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

The examiner has required restriction between product and process claims. Where applicant elects claims directed to the product, and the product claims are subsequently found allowable, withdrawn process claims that depend from or otherwise require all the limitations of the allowable product claim will be considered for rejoinder. All claims directed to a nonelected process invention must require all the limitations of an allowable product claim for that process invention to be rejoined.

In the event of rejoinder, the requirement for restriction between the product claims and the rejoined process claims will be withdrawn, and the rejoined process claims will be fully examined for patentability in accordance with 37 CFR 1.104. Thus, to be allowable, the rejoined claims must meet all criteria for patentability including the

requirements of 35 U.S.C. 101, 102, 103 and 112. Until all claims to the elected product are found allowable, an otherwise proper restriction requirement between product claims and process claims may be maintained. Withdrawn process claims that are not commensurate in scope with an allowable product claim will not be rejoined. See MPEP § 821.04(b). Additionally, in order to retain the right to rejoinder in accordance with the above policy, applicant is advised that the process claims should be amended during prosecution to require the limitations of the product claims. **Failure to do so may result in a loss of the right to rejoinder**. Further, note that the prohibition against double patenting rejections of 35 U.S.C. 121 does not apply where the restriction requirement is withdrawn by the examiner before the patent issues. See MPEP § 804.01.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. **Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (US 7,297,417) in view of Zhou (Advanced Functional Materials 2001, No. 4, P. 310-314).**

3. **Regarding Claims 1, 2 and 9**, Kim discloses and organic electroluminescent device (OLED) with an organic multilayer between first electrode (anode) and second electrode (cathode) containing an emitting layer, a hole transport layer (HTL) and a hole injection layer (HIL) (abstract). The device of Kim is shown below in Figure 1:

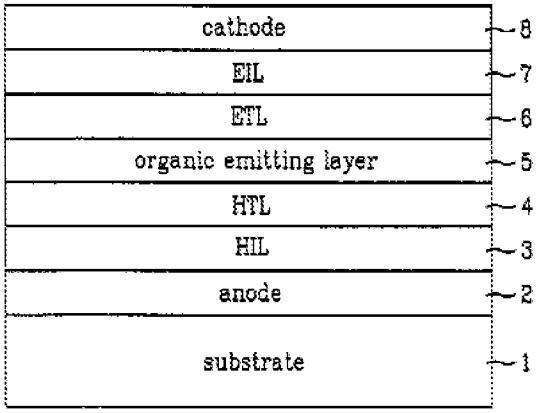
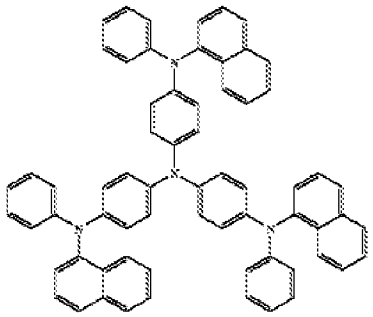


Figure 1 of Kim shows the HTL adjacent to the anode (positive electrode) side of the organic emitting layer (luminescent layer), a HIL is located between the HTL and the anode (positive electrode), an electron transporting layer (ETL) adjacent to the cathode (negative electrode) side of the organic emitting layer (luminescent layer) and an ETL adjacent to the EIL. Kims fails to show an EIL adjacent to the cathode (negative electrode) side of the organic emitting layer (luminescent layer).

The examiner takes the position that the EIL and ETL play similar roles in facilitating the flow of electrons, both are electron transport materials. For this reason, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have used one for the other as in Kim. Thus, rendering the EIL

adjacent to the cathode (negative electrode) side of the organic emitting layer with the resulting device having similar performance.

Kim discloses that the HIL can be made of the triphenyl amine derivative (4,4',4"-tris(2-naphthylphenylamino)triphenylamine) represented by formula 1 (page 2) (per claim 9):



Formula 1

Kim fails to mention an acceptor for the HIL represented by 2,3,5,6-tetrafluoro-7,7,8,8 tetracyanoquinodimethane (F4-TCNQ) and a the conductivity of the HIL continuously changes along a thickness direction of the HIL.

Zhou discloses an OLED with enhanced hole injection (abstract) where the HIL is made of a starburst amine 4,4',4"-tris(N, N-diphenylamino)triphenylamine) (TDATA) (page 310) (per claim 9). Zhou also discloses that 4,4',4"-tris(2-naphthylphenylamino)triphenylamine (1TNATA) (Kim's formula 1, above) have also been used in HIL(s) and HTL(s) (page 310). Zhou further mentions that the layers can also contain a strong acceptor, 2,3,5,6-tetrafluoro-7,7,8,8 tetracyanoquinodimethane (F4-TCNQ) (page 310) (per claim 2) which leads to OLED(s) that Zhou exhibit lower driving and operating voltages (abstract).

Since Zhou mentions the use of TDATA and 1-TNATA (Kim's formula 1, above) in the HIL, the examiner takes the position that these triphenylamine derivatives are interchangeable functional equivalents.

Zhou also discloses that TDATA and F4-TCNQ are prepared by coevaporation which can be controlled independently measuring them separately with quartz thickness monitors allowing the ratio to be controlled (gradient thickness) (page 311). Zhou mentions that the conductivity of the film (HIL) increases with dopant (F4-TCNQ) concentration (thickness).

With the expectation of success, it would have been obvious to a person of ordinary skill in the art at the time of the invention to have modified the HIL of Kim's OLED by adding the F4-TCNQ (acceptor) of Zhou under controlled coevapoartion conditions to enhance the hole injecting capacity of the HIL which would have involved adjusting the thickness of the F4-TCNQ component to achieve a continuous change in conductivity in the HIL.

4. **Regarding Claim 3**, Kim and Zhou teach the invention of claim1, Kim and Zhou fail to mention the acceptor in the HIL changes continuously along the thickness direction of the HIL.

Whereas Kim and Zhou teach the controlled thickness of F4-TCNQ in the HIL that affects conductivity, it would have been obvious to deposit the F4-TCNQ evenly

(continuously) in the thickness direction across the HIL to ensure a uniform enhancement of conductivity.

5. **Regarding Claims 4, 6, 5 and 7**, Kim and Zhou teach the invention of claim1 where figure 1 show the HIL adjacent to the HTL but fails to mention a border region with a reduced acceptor concentration formed in the vicinity of the HIL-HTL interface or that the acceptor concentration changes by at least 10% in the vicinity of the HIL-HTL interface.

Zhou discloses a method that controls the thickness of the acceptor and indicates the doped (acceptor containing) HIL(s) give OLED(s) with lower driving voltages, lower operating voltages (abstract), and higher efficiencies (page 314).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to have adjusted the acceptor concentration in the vicinity of the HIL-HTL interface to optimize the OLED overall performance which would have included a reduction in the acceptor concentration at the HIL-HTL interface and an acceptor concentration change by at least 10% in the vicinity of the HIL-HTL interface.

6. **Regarding Claim 8**, Kim and Zhou teach the invention of claim 2, Kim and Zhou fail to mention the HIL has first and second border regions with reduced acceptor concentrations in the vicinity of the HIL-HTL interface and in the vicinity of another HIL-HTL interface and the positive electrode (anode), respectively.

Zhou discloses a method that control the thickness of the acceptor and indicates the doped (acceptor containing) HIL(s) give OLED(s) with lower driving voltages, lower operating voltages (abstract), and higher efficiencies (page 314).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to have adjusted the acceptor concentration in multiple regions in the vicinity of the HIL-HTL interface to optimize the OLED overall performance which would have included a reduced acceptor concentrations in the vicinity of the HIL-HTL interface and in the vicinity of another HIL-HTL interface and the positive electrode (anode).

7. **Regarding Claim 10,** Kim discloses an OLED where the positive electrode (anode) is made of indium-tin oxide (conductive oxide) (paragraph 7) and the HIL has a thickness of 0.1 to 300 nm. The applicant claims a thickness of 40-50 nm.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GREGORY CLARK whose telephone number is (571)270-7087. The examiner can normally be reached on M-Th 7:00 AM to 5 PM Alternating Fri 7:30 AM to 4 PM and Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Larry Tarazano can be reached on (571) 272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. Lawrence Tarazano/
Supervisory Patent Examiner, Art Unit 1794

GREGORY CLARK/GDC/
Examiner
Art Unit 1794